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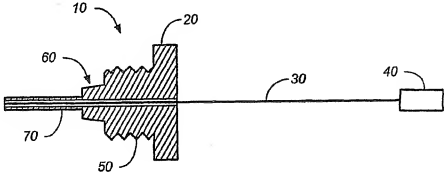
(54) Title: POLYMER CONNECTORS FOR USE IN SURFACE PLASMON RESONANCE SENSOR



(57) Abstract: A device for connecting optical components of a fiber optic probe and a jumper in a Surface Plasmon Resonator (SPR) has two high-pressure-liquid-chromatography (HPLC) polyetheretherketone (PEEK) connectors, one containing the optical fibers from a probe and the other containing optical fibers which link to a detector and a light source. A method of joining a probe's distal end to a jumper, with at least two fibers or a multimode fiber connected to a light source and to a detection apparatus, has the steps of covering the distal end of the probe with a plastic sleeve, placing the sleeved distal end into a PEEK connector, trimming the distal end of the probe to be even with the edge of the PEEK connection, and connecting the PEEK connector with the jumper.

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Polymer Connectors for Use in Surface Plasmon Resonance Sensor

SPECIFICATION

BACKGROUND

Technical Field

[0001] This invention concerns Surface Plasmon Resonance (SPR) spectroscopy and more specifically, a reusable coupling device for connecting the optical fiber and jumper in a SPR probe.

Prior Art

[0002] In wide use in the SPR field are SMA connectors. SMA is an acronym for SubMiniature version A and was developed in the 1960's. SMA connectors are widely used in the electronics and cable communication industries. A typical SMA connector for small-gauge fiber-optics weighs about 6 grams, costs approximately 9 dollars US and can be used about two to three times.

[0003] What is needed is a lighter weight, less costly and more reusable fiber-optic connector.

SUMMARY OF THE INVENTION

[0004] In one embodiment, there is disclosed a device for connecting optical components of a fiber optic probe and a jumper in a Surface Plasmon Resonator (SPR) comprising two high-pressure-liquid-chromatography (HPLC) polyetheretherketone (PEEK) connectors, one containing the optical fibers from a probe and the other containing optical fibers which link to a detector and a light source. In this device the connectors may be joined by an HPLC union that affords a zero-volume junction.

[0005] In another embodiment, there is disclosed a method of joining an SPR probe's distal end to a jumper with at least two fibers or a multimode fiber connected to a light source and to a detection apparatus. The method includes the steps

place by epoxy. The optical fiber 30 in the sleeve 60 passes through the connector 20 to a ferrule 60. The end of the optical fiber 30 extending beyond the ferrule 60 is trimmed to be flush with the polishing disk.

[0013] A jumper (not shown) was made with the same type of PEEK connector. The jumper had two 200 μm fibers, one connected with the optical fiber 30 in the PEEK connector 20. One fiber of the jumper connected with a light source and the other end connected to a detector. An HPLC union was used to connect the probe to the jumper. In this embodiment, a zero-volume union was used.

[0014] The whole combination was tested in ethanol and air. FIG. 3 shows the spectrum taken when the exposure time was 300 milliseconds and the delay was 500 milliseconds. The intensity of light at the detector seemed higher than with previous connectors. The spectrum exhibited a sharp decrease in intensity characteristic of the SPR signal for ethanol when referenced to air.

[0015] Table 1 summarizes a comparison between a prior art SMA connector and the inventive PEEK SMA connector.

Table 1

	SMA	PEEK
Weight (g)	6.15	0.65
Cost (US$ in 2002)	8.75	4.13
Number of Reuses	2-3	>10

Preparation of SPR probe and Connector

[0016] The optical fibers used for SPR probes are approximately 400 μm in diameter, although sizes as small as 50 μm can be used. Before connection, the optical fiber was inserted into a plastic sleeve, made of PEEK. The dimensions of the capillary sleeve are approximately 1.59 mm external diameter and 395 μm internal diameter. The optical fiber is fixed inside the capillary sleeve with glue, preferably epoxy. Then the HPLC PEEK connector is mounted with a ferrule on the capillary sleeve with the optical fiber. To gauge the length of the probe, it is mounted on a custom-made chuck that also serves as a polishing disk. The chuck provides a zero-volume union cut exactly in the middle and mounted on a stainless steel disk. Then the SPR probe is prepared by depositing gold on the fiber optic using a sputter coater. The optical fiber end is evenly coated using a rotation stage. The finished product is shown in FIG. 1.

What is claimed is:

1. A device for connecting optical components of a fiber optic probe and a jumper in a Surface Plasmon Resonator (SPR) comprising two high-pressure-liquid-chromatography (HPLC) polyetheretherketone (PEEK) connectors, one containing the optical fibers from a probe and the other containing optical fibers which link to a detector and a light source.

2. The device of claim 1, wherein the connectors are joined by an HPLC union that affords a zero-volume junction.

3. A method of joining a probe's distal end to a jumper with at least two fibers or a multimode fiber connected to a light source and to a detection apparatus, the method comprising

a. covering the distal end of the probe with a plastic sleeve;

b. placing the sleeved distal end into a PEEK connector;

c. trimming the distal end of the probe to be even with the edge of the PEEK connection; and

d. connecting the PEEK connector with the jumper.

4. The method of claim 3, further comprising connector the PEEK connector with the jumper with an HPLC PEEK union.

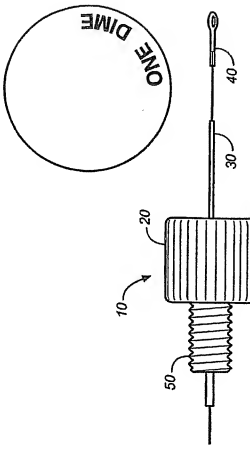

FIG._1

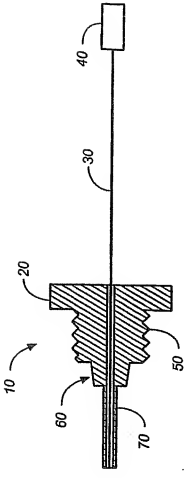

FIG._2

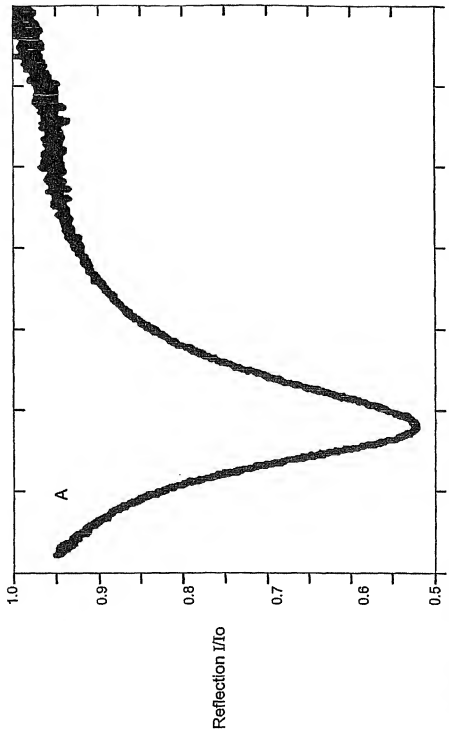
A
1.0
0.9
0.8
0.7
0.6
0.5
Reflection r/ro
550
600
650
700
750
800
850
900
Wavelength (nm)

FIG._3